METHOD AND APPARATUS FOR RECORDING, METHOD AND APPARATUS FOR REPRODUCTION, RECORDING MEDIUM AND ITS MANUFACTURE AS WELL AS MASTER DISC OF RECORDING MEDIUM AD ITS MANUFACTURE

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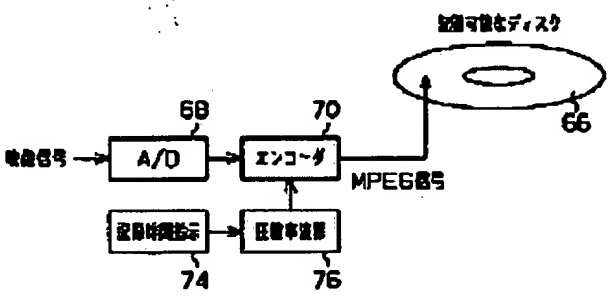
Abstract of **JP8017137**

PURPOSE:To utilize a recording medium efficiently and record high quality information. CONSTITUTION:An encoder 70 by which moving picture information is coded with MPEG method in accordance with a bit rate which is used when digital moving picture information is transferred to a magneto-optical disc 66 is provided. A compression rate calculating circuit 76 which calculates the bit rate for the transfer of the moving picture information to the magneto-optical disc 66 in accordance with the recording capacity of the magneto-optical disc 66 and a predetermined recording time and outputs the calculated result to the encoder 70 is provided. With this constitution, as the bit rate is varied in accordance with the recording capacity of the disc 66, high quality information can be recorded by using the most of the recording region of the disc 66.



* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the original edition and its manufacture approach of a record medium at the record approach and equipment, the playback approach and equipment, a record medium and its manufacture approach, and a list.
[0002] It is related with the record approach and equipment which record the information on high quality especially, using a record medium efficiently. Moreover, it is related with the playback approach and equipment which can reproduce the information on high quality simply from the record medium with which bit rates differ. Furthermore, on the occasion of operation of the record approach, it is related with the original edition and its manufacture approach of a record medium at a suitable record medium and its manufacture approach, and a list.
[0003]
[Description of the Prior Art] Generally, quality, such as an image or voice, and the chart lasting time to the record medium of the information conflict among the information recorded on a record medium. That is, if quality is raised, chart lasting time will become short, and if chart lasting time is lengthened, quality will deteriorate. For this reason, various attempts for chart lasting time to acquire the long record approach with sufficient quality are made.
[0004] JP,63-94451,A (G11B15/02) **** -- VTR which balanced quality and chart lasting time is indicated. This VTR is the die length (time amount) of a program. From a tape residue, that program is recorded in a tape residue combining a canonical mode and the 3 time mode.
[0005] However, by the record approach of changing a tape speed in this way, there is a trouble that image quality will change, also in the same program at the time of modification in the mode. JP,62-145977,A (H04N5/781) **** -- the electronic "still" camera which sets up record spacing (continuous-shooting speed) from the remaining storage capacity and chart lasting time is indicated. However, since this approach is a technique for a still picture, it is an animation and has the trouble of being inapplicable to record of a digital image.
[0006] Here, the record approach of the digital data of an image is explained. In what the compression technology of data, such as a dynamic image and voice, progresses, for example, is called a "video CD", data, such as a dynamic image of 1 hours or more, are recorded into the record medium of CD-ROM. In case these image data is recorded, compression processing is performed, but image quality and tone quality become high, so that this compressibility is low.
[0007] When recording a dynamic image in digital one, it considers compressing namely, encoding amount of information. As a method for this, there is MPEG (Moving PictureExpert Group) like common knowledge.
[0008] Image coding methods, such as an MPEG method, are shown also in the following reference, and it is common knowledge very much. Moreover, from the first, although MPEG is the identifier of the committee which examines the animation coding method for are recording, it is used as general terminology by current.
[0009] (A) "Data compression and digital modulation" Nikkei Business Publications
(B) "International standards of multimedia coding" Yasuda ******, and Maruzen Co., Ltd.
(C) International Standard "ISO Standard 11172."
[0010] (D) "special edition : understanding and application" of image data compression; An interface, Vol.17, No.12, PP.132 -231, CQ publishing company.
moreover -- JP,3-224380,A (H04N5/92) and JP,4-326687,A (H04N5/92) -- discrete cosine conversion (DCT) etc. -- by processing, the approach of recording the signal which carried out the information compression on an optical disk is indicated.
[0011] Next, the image coding method by the MPEG method is explained. In MPEG, a motion compensation inter-

frame prediction technique is used, and the data compression is performed. a motion compensation inter-frame prediction technique -- a certain screen (frame) between the prediction screens which did not send all the data of that screen, for example, were corrected using this screen and a front screen lost-motion vector when reproducing -- a difference -- taking -- this difference -- information (difference screen) It encodes. In addition, such processing is performed not per the whole screen but per divided block.

[0012] With a motion compensation inter-frame prediction technique, prediction from a front screen is usually performed. Before MPEG shows to drawing 12 (past) Not only a screen but after (future) It predicts also from the screen.

[0013] The screen which carries out compression (compression between image units) processing using the prediction screen from a front screen is called P picture by MPEG. The screen which carries out compression processing using the prediction screen from the screen of order is called B picture. The screen which became independent, without using a prediction screen and which carries out compression (compression within image unit) processing is called I picture.

[0014] B picture may not necessarily be the screen which carries out compression processing using the prediction screen from both the screens of order. That is, even if it is B picture, as long as there is no functionality with a front screen, the prediction screen only from a next screen may be used. Moreover, even if it is B picture, as long as there is no functionality in a front screen and a front next screen, you may be the same screen as I picture, without using a prediction screen. Such a thing may occur per block. In addition, the information "order, before, after, and nothing" which specifies a screen in case a prediction screen is created is expressed per block, and is called macro block type information.

[0015] Thus, the prediction screen from the screen of order is used in B picture. Therefore, in the phase of processing B picture, the information on a next screen must already be incorporated.

[0016] Then, he rearranges the inputted frame of a digital image and is trying to send P picture and I picture after B picture before the B picture in MPEG.

[0017] And B picture is referred to from I picture or P picture of the future and the past, and is compressed between image units. Moreover, I picture is compressed in an image unit. In I picture, as an image is divided into two or more blocks A and it is shown in drawing 13 , DCT is performed and it is changed into a frequency component B.

[0018] With a value D, the division of this obtained frequency component B is done, and it is quantized. It quantizes so that human being's vision property may use an insensible thing to a RF, may assign many signs to a low frequency side and may lessen the amount of signs by the side of a RF at the time of this quantization.

[0019] That is, the above-mentioned value D is a value acquired by the multiplication of the quantization matrix D1 to which the value of the field equivalent to a RF was set greatly, and a quantization step D2. In this way, the obtained quantization data E are taken from a low frequency side to zigzag to a high frequency side, and variable length coding of this result is carried out.

[0020] moreover, image (B picture and P picture) which compresses between image units **** -- inside of the predetermined field of the image which divides an image into the field of a predetermined number and is referred to (a field dozens times [several times to] the area of usually having been divided) from -- the nearest field of a data value -- extracting -- difference information on this location (motion vector information) Difference (difference screen information) of data It encodes.

[0021] That is, the difference of the present screen and a prediction screen is taken and it encodes like I picture henceforth. Thus, since B picture and P picture transmit difference, the amount of data is small. Since compression within an image unit is performed without the image to refer to, the compressed amount of data of I picture has increased. I required of actual MPEG in order to reproduce the image of the same quality: P: Each amount of signs of B is 7:3:1. Extent (to the last pro forma amount) It has become. Thus, the amount of data compressed with the image (the amount of bits) It will differ.

[0022] Generally, with the encoder of an MPEG method, compressed data is once stored in buffer memory, and the fixed read-out bit rate is made to perform read-out of data from the buffer memory. Therefore, there will be much amount of data memorized on buffer memory at I picture, and it will change few by B picture on the contrary. Consequently, when an image with much amount of data continues, there is a possibility that buffer memory may overflow.

[0023] Then, as shown in drawing 13 , while changing granularity of quantization by changing a quantization step D2 in the case of quantization of image data (namely, compressibility control), the transfer bit rate (only henceforth a bit rate) is set constant by carrying out feedback control of the amount of transaction datas. That is, if compressibility will become high, the amount of data of an image will decrease, if a quantization step D2 is enlarged, and a quantization step D2 is made small on the contrary, compressibility will become low and the amount of data of an image will increase.

[0024] In actual MPEG, the quantization step D2 is set up so that a predetermined bit rate may be suited and compressibility may somewhat become height. If it does in this way, overflow of buffer memory will not be generated. On the other hand, an underflow may be generated occasionally and all buffer memory may become a free area. In this case, it is sending out (called padding) about dummy data. It is coped with by the approach of carrying out.
[0025] Next, the setting approach of a quantization step D2 is explained. The amount of data which serves as [the beginning] a target at each screen gestalt (I picture, P picture, and B picture) of every (the amount of target bits) It assigns.
[0026] And the amount of data generated for every 1 macro block train is observed, and comparative evaluation of the amount of target bits is carried out for the transition amount of data. Consequently, when the amount of data is larger than the amount of target bits, quantization width of face is enlarged and it quantizes coarsely. Conversely, when the amount of data is smaller than the amount of target bits, quantization width of face is made small and it quantizes finely. And buffer memory eases fluctuation of the amount of generating bits which changes for every screen by the screen class, the contents of a screen, and the quantization step D2.
[0027] In addition, it is necessary to also take into consideration the capacity limitation of the buffer memory by the side of a decoder in an encoder. In this case, the amount of storing in the buffer memory by the side of a decoder is simulated by observing the amount of storing in the buffer memory by the side of an encoder, and control of quantization width of face is performed so that the buffer memory by the side of a decoder may not cause overflow. That is, a quantization step D2 may be determined as reference also in the variation of the value of the empty capacity of buffer memory, or the empty capacity of buffer memory.
[0028] According to the amount of generating bits at that time, a quantization step D2 is made to change, the amount of generating bits is controlled by actual MPEG, and the are recording situation is controlled by it by buffer memory. As this quantization step D2, the value of 1-31 is usually taken.
[0029] In addition, although it is not general, by the specification of MPEG, a bit rate is not immobilization and modification is also allowed. Naturally modification of the bit rate of the data set up also changes a quantization step according to this.
[0030] By the way, the quantization matrix D1 is also employable as a parameter of the amount control of signs in the case of quantization in addition to quantization step D2. Human being's vision property is insensible to a RF among the frequency components B obtained by carrying out DCT processing. The quantization matrix D1 is a multiplier given to different every frequency component B, as many signs are assigned to a low frequency side and the amount of signs by the side of a RF is lessened using this.
[0031] On MPEG1 by which current standardization is carried out, and (ISO/IEC11172) the default table of MPEG 2 (ISO/IEC13818), all the multipliers of image unit compression coding are the equivalents. However, modification is possible. It is stored in the quantization matrix table, the multiplier D1, i.e., the quantization matrix, corresponding to this frequency component.
[0032] The endocyst of the 1GOP (Group Of Picture) is for the specification top of the thing corresponding to the program to which the data of this quantization matrix D1 are called a sequence for which the thing for compression between the object for the compression within an image unit and image units is loaded for every concept to have become possible, and, as for this, to just be carried out also at the lowest. For this reason, in a smallest unit, it is possible to change the quantization matrix D1 per 1GOP. In this case, if the value of a matrix D1 is enlarged, it will become possible for each data value outputted after quantization to become small, and to become what has many zero, and to make compressibility high.
[0033] When recording a dynamic image on disks, such as a video CD, in digital one as having described above, the bit rate is fixed by changing a quantization step D2 or the quantization matrix D1, and controlling compressibility.
[0034] Moreover, a bit rate is immobilization similarly about the case where voice is recorded on disks, such as CD, in digital one apart from a dynamic image.
[0035]
[Problem(s) to be Solved by the Invention] In order to enable it to obtain high definition and the quality of loud sound in the record approach of of the above-mentioned dynamic image or voice, it is effective to make the compressibility of data low as much as possible. However, since a bit rate is immobilization, making compressibility low has a limitation.
[0036] Moreover, chart lasting time will be decided by the total amount of the data which record that a bit rate is immobilization. namely, (total amount of the data to record) / (bit rate) It becomes = chart lasting time.
[0037] Therefore, when there are few total amounts of the data to record than the capacity which can be used in a record medium for record, an intact recordable field will remain in a record medium. If it puts in another way, when there is less chart lasting time of the image and speech information to record than the recordable maximum chart lasting time,

an intact recordable field will remain in a record medium.
[0038] Also in the above-mentioned "video CD", such an intact record section possible field occurs. Moreover, if all record sections are used and the album for 46 minutes will be recorded on recordable CD for music for 74 minutes, the field which can record remaining 28 minutes will keep a complementary. This is because the bit rate of Music CD is immobilization, so chart lasting time is determined.
[0039] Compressed data based on MPEG described so far has been premised on being a fixed bit rate for image data on the convenience of the read-out equipment of the record medium, and inside a record medium.
[0040] However, since it was a fixed bit rate, the problem of balance, such as a part at the sacrifice of image quality and a part with the given excessive bit rate, had arisen inside one dynamic-image sequence. This is because the bit rate was raised beyond the need about easy compressive image (image [with few high frequency components], and image with few motions) data and the bit rate is lowered to below the need about difficult compressive image (image [with many high frequency components], and intense image of motion) data.
[0041] For this reason, in the case of the former, image quality will be higher than an average, and, in the case of the latter, image quality will become lower than an average. However, the image which a viewer observes has many cases of the latter part, and, for this reason, it usually tends to result in giving the impression that image quality subjective as a whole is low.
[0042] Usually, when viewing and listening to one dynamic-image software, such as a movie, it is desirable for image quality to be subjectively uniform over the whole volume. Since the impression of a part with the low image quality becomes strong when image quality has change especially within image software, it is because there is an inclination to give the impression that image quality is low, to the whole software. moreover, the character top of the compression technique of MPEG in the parts of an image complicated as mentioned above and the intense image of a motion and image quality -- falling -- in addition -- and since a viewer tends to observe this part, the phenomenon in which image quality senses low through the whole software further will arise.
[0043] For this reason, the part with easy compression lowers a bit rate, and the approach the part with difficult compression adjusts so that a bit rate may be raised and the image quality at the time of playback may become homogeneity as the whole sequence is proposed. Moreover, development of the decoder which can receive the stream of such a time amount Variable Bit Rate has been attained by development of the technique of the read-out equipment of a record medium. This is because control of data read-out which does not have a problem in the case of a Variable Bit Rate was attained by preparing buffer memory in a read-out equipment side, and performing intermittent playback of data.
[0044] However, also in the case of this time amount Variable Bit Rate, naturally, technique, such as using the amount of bits more than the amount of requests which stores that image software in a record medium like the conventional case, is needed. This is because it is necessary to raise the image quality of the image software as much as possible.
[0045] This invention is made in order to solve the above-mentioned trouble, and it has the following purposes.
1] Offer the record approach and equipment which can record the information on high quality, using a record medium efficiently.
[0046] 2] Offer the playback approach and equipment which can reproduce the recording information of high quality easily from the record medium with which bit rates differ.
3] Offer the record approach and equipment which can record the information on uniform quality on a storage.
[0047] 4] Offer the record medium which can obtain a suitable record medium on the occasion of operation of the record approach, and its manufacture approach.
5] Offer the original edition which can obtain the original edition of a suitable record medium on the occasion of operation of the record approach, and its manufacture approach.
[0048]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, invention according to claim 1 makes it a summary to change the compressibility of said information in the record approach which records information on a record medium based on the chart lasting time of said information, and the storage capacity of said record medium.
[0049] Invention according to claim 2 makes it a summary to make a change of said compressibility by changing a bit rate in invention according to claim 1. Invention according to claim 3 makes it a summary to prepare limiting value, such as an upper limit or a minimum, in the record approach according to claim 2 at said bit rate.
[0050] Invention according to claim 4 makes it a summary for said bit rate to be the value which did the division of the storage capacity of a record medium by the chart lasting time of said information in the record approach according to claim 2 or 3.

[0051] Invention according to claim 5 makes a summary what the compressibility of said information is changed, and information is compressed according to the changed compressibility based on the chart lasting time of said information, and the storage capacity of said record medium, and is recorded on said record medium in the record approach which records information on a record medium.
[0052] Invention according to claim 6 makes it a summary to make a change of said compressibility by changing a bit rate in the record approach according to claim 5. Invention according to claim 7 makes a summary what is recorded on a record medium, after being adjusted in the record approach according to claim 5 or 6 so that said compressed information may suit a record format of said record medium.
[0053] Invention according to claim 8 makes it a summary to record it on a record medium, after said compressed information is multiplexed with at least one kind of other information in the record approach given in any 1 term among claims 5-7.
[0054] Invention according to claim 9 makes it a summary to read it from the memory and to record it on a record medium, once said compressed information is stored in memory in the record approach given in any 1 term among claims 5-7.
[0055] Invention according to claim 10 makes a summary what said compressed information consists of information on two or more classes, it is alternatively read from each of that memory once each information is stored in two or more memory, respectively, and is recorded on a record medium in the record approach according to claim 9.
[0056] Invention according to claim 11 makes a summary what the value of a bit rate is calculated based on the storage capacity of said record medium, and the chart lasting time of said digital dynamic-image information set up beforehand, and compression coding of the digital dynamic-image information is carried out by the MPEG (Moving Picture ExpertGroup) method according to the called-for bit rate, and is recorded on said record medium in the record approach which encodes digital dynamic-image information and is recorded on a record medium.
[0057] Invention according to claim 12 makes a summary what the amount of generating bits when changing analog information into digital information is determined based on the storage capacity of said record medium, and the chart lasting time of the analog information recorded on the record medium, and analog information is changed into digital information according to the determined amount of generating bits, and is recorded on said record medium in the record approach which changes analog information into digital information and is recorded on a record medium.
[0058] In the record approach which invention according to claim 13 encodes digital dynamic-image information, and is recorded on a record medium The average of a bit rate is calculated based on the storage capacity of said record medium, and the chart lasting time of said digital dynamic-image information set up beforehand. When changing a bit rate with time according to the contents of digital dynamic-image information, Let what compression coding of the digital dynamic-image information is carried out by the MPEG (Moving Picture Expert Group) method, and is recorded on said record medium so that the value of an average of this changing bit rate may turn into said calculated average value be a summary.
[0059] Invention according to claim 14 makes it a summary to choose said record medium from an optical disk, a magneto-optic disk, a phase change mold disk, a hard disk, a magnetic tape, and semiconductor memory in the record approach given in any 1 term among claims 1-13.
[0060] Invention according to claim 15 makes it a summary for said record medium to be a disk in the record approach according to claim 1 to 13. Invention according to claim 16 makes it a summary for said disk to be a magneto-optic disk in the record approach according to claim 15.
[0061] Invention according to claim 17 makes it a summary for said disk to be the original recording for optical disk creation in the record approach according to claim 15. Invention according to claim 18 makes it a summary for said storage capacity to be the total storage capacity of said record medium in the record approach given in any 1 term among claims 1-17.
[0062] Invention according to claim 19 makes it a summary for said storage capacity to be the storage capacity of the non-record section of said record medium in the record approach given in any 1 term among claims 1-17.
[0063] Invention according to claim 20 makes it a summary for said information to be information processed on real time, such as image information and speech information, in the record approach given in any 1 term among claims 1-19.

[0064] Invention according to claim 21 makes it a summary to have had a compressibility modification means to change the compressibility in said coding means, based on the coding means which carries out compression coding of the information recorded on a record medium, and the chart lasting time of said information and the storage capacity of said record medium.
[0065] Invention according to claim 22 determines compressibility based on the bit rate when transmitting digital

information to a record medium, calculates the value of the bit rate which transmits digital information to a record medium based on a coding means to encode digital information by the MPEG method according to the determined compressibility, the storage capacity of said record medium, and the chart lasting time set up beforehand, and makes it a summary to have had a compressibility modification means outputted the result of an operation to said coding means.
[0066] Invention according to claim 23 makes it a summary to equip said recording device with a reconstruction means to reconfigurate the information encoded by said coding means so that a record format of said record medium may be suited.
[0067] In a recording device given in any 1 term, two or more said coding means are established for invention according to claim 24 among claims 21-23, and said recording device makes it a summary to have a multiplexing means to multiplex the information encoded by two or more coding means.
[0068] Invention according to claim 25 makes it a summary to equip said recording device with the memory which stores the information encoded by said coding means in a recording device given in any 1 term among claims 21-24.
[0069] In a recording device according to claim 25, two or more said coding means are established for invention according to claim 26, two or more said memory is prepared corresponding to each coding means, and said recording device makes it a summary to have further the selection means which reads alternatively the condensed information stored in each memory based on the result of an operation of said compressibility modification means.
[0070] Invention according to claim 27 determines compressibility based on the amount of generating bits when changing analog information into digital information, calculates the value of the amount of generating bits based on an analog-to-digital-conversion means to change analog information into digital information according to the determined compressibility, the storage capacity of said record medium, and the chart lasting time of said analog information set up beforehand, and makes it a summary to have had a compressibility modification means outputted the result of an operation to said analog-to-digital-conversion means.
[0071] Invention according to claim 28 makes it a summary to have had an average compressibility operation means to calculate the average value of a bit rate based on the storage capacity of a record medium, and the chart lasting time of the digital dynamic-image information set up beforehand, and an adjustable coding means to encode digital dynamic-image information by the MPEG method so that the value of an average of this bit rate may turn into said average value while changing a bit rate with time according to the contents of digital dynamic-image information. Invention according to claim 29 makes it a summary for said information to be information processed on real time, such as image information and speech information, in a recording device given in any 1 term among claims 21-28.
[0072] Invention according to claim 30 is the approach of reading information and reproducing with a predetermined read-out bit rate, from the record medium with which the transfer bit rates when recording information differ, and makes it a summary to have set up the value of said read-out bit rate more highly than the value of said transfer bit rate.
[0073] Invention according to claim 31 makes it a summary to set up the value of said read-out bit rate more highly than the value of the greatest bit rate of the transfer bit rates from which two or more record media differ in the playback approach according to claim 30.
[0074] Invention according to claim 32 makes it a summary to set up the value of said read-out bit rate more highly than the value of the greatest bit rate of two or more transfer bit rates from which it differs in one record medium in the playback approach according to claim 30.
[0075] Invention according to claim 33 makes it a summary to set up the value of said read-out bit rate gradually with the value lower than the high value, including a value higher than the value of the greatest bit rate of two or more transfer bit rates from which it differs in one record medium in the playback approach according to claim 30.
[0076] Invention according to claim 34 makes it a summary to have had the high-speed read-out means which reads recording information with a read-out bit rate higher than the transfer bit rate when recording information on said record medium in the regenerative apparatus with which it is equipped with the record medium with which transfer bit rates differ.
[0077] Invention according to claim 35 makes it a summary to set up more highly than the value of the greatest bit rate of the transfer bit rates from which two or more record media differ the read-out bit rate of said high-speed read-out means in a regenerative apparatus according to claim 34.
[0078] Invention according to claim 36 makes it a summary to set up more highly than the value of the greatest bit rate of two or more transfer bit rates from which it differs in one record medium the read-out bit rate of said high-speed read-out means in the playback approach according to claim 34.
[0079] Invention according to claim 37 makes it a summary to set up gradually the read-out bit rate of said high-speed read-out means with the value lower than the high value, including a value higher than the value of the greatest bit rate of two or more transfer bit rates from which it differs in one record medium in a regenerative apparatus according to

claim 34.
[0080] Invention according to claim 38 makes it a summary to equip said regenerative apparatus with a storage means memorize the digital information of the record medium read by said high-speed reading means, a detection means detect the capacity of the digital information memorized by said storage means, and the control means that controls said storage means and said high-speed reading means based on the capacity of the digital information detected by said detection means.
[0081] Invention according to claim 39 makes it a summary to choose said record medium from an optical disk, a magneto-optic disk, a phase change mold disk, a hard disk, a magnetic tape, and semiconductor memory in a regenerative apparatus given in any 1 term among claims 34-38.
[0082] In the approach of manufacturing a record medium using the original edition of the record medium with which the information into which invention according to claim 40 was compressed with predetermined compressibility was recorded Two or more condensed information compressed with different compressibility is created. The amount of information of each of that created condensed information, Let it be a summary to choose the condensed information recorded on the original edition among said two or more condensed information based on the storage capacity of a record medium, to create the original edition which wrote in the selected condensed information, and to create a record medium using the original edition.
[0083] In the approach of manufacturing a record medium using the original edition of the record medium with which the information into which invention according to claim 41 was compressed with predetermined compressibility was recorded Two or more condensed information compressed with different compressibility is created. The amount of information of each of that created condensed information, Let it be a summary to choose the condensed information recorded on the original edition among said two or more condensed information based on the storage capacity of a record medium, to create the original edition which wrote in the selected condensed information, and to create a record medium using the original edition.
[0084] Invention according to claim 42 makes it a summary for said information to be information processed on real time, such as image information and speech information, in the manufacture approach of a record medium according to claim 40 or 41.
[0085] Invention according to claim 43 makes it a summary to choose said record medium from an optical disk, a magneto-optic disk, a phase change mold disk, a hard disk, a magnetic tape, and semiconductor memory in the manufacture approach of a record medium given in any 1 term among claims 40-42.
[0086] Invention according to claim 44 makes a summary what the compressibility of said information was changed and was recorded, when excess and deficiency will arise in the storage capacity of a record medium, if information is written in with basic compressibility.
[0087] In a record medium according to claim 44, if information is written in with basic compressibility, when lack will arise in storage capacity, the compressibility of said information is made high, and invention according to claim 45 records it, and makes it a summary to have canceled said lack.
[0088] Invention according to claim 46 makes it a summary for the compressibility of said base to be the minimum compressibility of the information recorded on a record medium in a record medium according to claim 45. In a record medium according to claim 44, if information is written in with basic compressibility, when an excess arises, the compressibility of said information will be made low, and invention according to claim 47 will record it, and will make it a summary to have decreased said excess with storage capacity.
[0089] Invention according to claim 48 makes it a summary for the compressibility of said base to be the maximum pressure shrinking percentage of the information recorded on a record medium in a record medium according to claim 47. Invention according to claim 49 makes it a summary for said information to be information processed on real time, such as image information and speech information, in a record medium given in any 1 term among claims 44-48.
[0090] In the approach of manufacturing the original edition of the record medium with which the information into which invention according to claim 50 was compressed with basic compressibility was recorded If information is recorded on said original edition with basic compressibility, when excess and deficiency will arise in the storage capacity of the original edition, based on informational chart lasting time and the storage capacity of the original edition, the compressibility of said base is changed and let it be a summary to create the original edition which compressed and wrote in information with the changed compressibility.
[0091] In the approach of manufacturing the original edition of the record medium with which the information into which invention according to claim 51 was compressed with predetermined compressibility was recorded Two or more condensed information compressed with different compressibility is created, and the condensed information recorded on the original edition among said two or more condensed information is chosen based on the amount of information of

each of that created condensed information, and the storage capacity of the original edition, and let it be a summary to create the original edition which wrote in the selected condensed information.
[0092] Invention according to claim 52 makes it a summary for said information to be information processed on real time, such as image information and speech information, in the manufacture approach of the original recording of a record medium according to claim 50 or 51.
[0093] Invention according to claim 53 makes a summary what the compressibility of said information was changed and was recorded, when excess and deficiency will arise in storage capacity, if information is written in with basic compressibility. In the original recording of a record medium according to claim 53, if information is written in with basic compressibility, when lack will arise in storage capacity, the compressibility of said information is made high, and invention according to claim 54 records it, and makes it a summary to have canceled said lack.
[0094] Invention according to claim 55 makes it a summary for the compressibility of said base to be the minimum compressibility of the information recorded on original recording in the original recording of a record medium according to claim 54.
[0095] In the original recording of a record medium according to claim 53, if information is written in with basic compressibility, when an excess arises, the compressibility of said information will be made low, and invention according to claim 56 will record it, and will make it a summary to have decreased said excess with storage capacity.
[0096] Invention according to claim 57 makes it a summary for the compressibility of said base to be the maximum pressure shrinking percentage of the information recorded on original recording in the original recording of a record medium according to claim 56.
[0097] Invention according to claim 58 makes it a summary for said information to be information processed on real time, such as image information and speech information, in the original recording of a record medium given in any 1 term among claims 53-57.
[0098]
[Function] According to invention according to claim 1, it becomes possible to record the information on high quality, using a record medium efficiently.
[0099] According to invention according to claim 2, modification of compressibility becomes easy. According to invention according to claim 3, trouble is not caused to read-out by the side of playback by the upper limit. The minimum quality of the information recorded by the minimum is secured.
[0100] According to invention according to claim 4, a bit rate is called for simply. According to invention according to claim 5, it becomes possible to record the information on high quality, using a record medium efficiently.
[0101] According to invention according to claim 6, modification of compressibility becomes easy. According to invention according to claim 7, it becomes possible to record condensed information corresponding to a format of a different record medium.
[0102] According to invention according to claim 8, it becomes possible to record two or more information on one record medium. According to invention according to claim 9, before recording condensed information on a record medium, it becomes possible to carry out storage maintenance temporarily.
[0103] According to invention according to claim 10, it becomes possible to choose condensed information and to record on a record medium. According to invention according to claim 11, it becomes possible to record the information on the dynamic image of high quality etc., using a record medium efficiently.
[0104] According to invention according to claim 12, it becomes possible to record the analog information of high quality, using a record medium efficiently. According to invention according to claim 13, it becomes possible to record the information on uniform quality on a storage.
[0105] According to invention according to claim 14 to 17, on the occasion of operation of the record approach, it becomes a suitable record medium. According to invention according to claim 18, it becomes possible to record the information on high quality on an effective target using all the record sections of a record medium.
[0106] According to invention according to claim 19, it becomes possible to record the information on high quality on an effective target using the non-record section of a record medium. According to invention according to claim 20, on the occasion of operation of the record approach, it is effective.
[0107] According to invention according to claim 21, it becomes possible to record the information on high quality on an effective target using a record medium. Claim 22 According to invention of a publication, it becomes possible to record the information on high quality on an effective target by changing a bit rate using a record medium.
[0108] According to invention according to claim 23, it becomes possible to record condensed information corresponding to a format of a different record medium. According to invention according to claim 24, it becomes possible to record two or more information on one record medium.

[0109] According to invention according to claim 25, before recording condensed information on a record medium, it becomes possible to carry out storage maintenance temporarily. According to invention according to claim 26, it becomes possible to choose condensed information according to modification of compressibility, and to record the information on high quality on a record medium.
[0110] According to invention according to claim 27, it becomes possible to record the analog information of high quality, using a record medium efficiently. According to invention according to claim 28, it becomes possible to record the information on uniform quality on a storage.
[0111] According to invention according to claim 29, on the occasion of the handling of a recording device, it becomes effective information. According to invention according to claim 30, it becomes possible to reproduce recording information simply from the record medium with which bit rates differ.
[0112] According to invention according to claim 31, it becomes possible to reproduce recording information simply and certainly from the record medium with which bit rates differ. According to invention given in claims 32 and 33, even if the information on a bit rate which is different in one storage is recorded, it becomes possible to reproduce each recording information simply.
[0113] According to invention according to claim 34, it becomes possible to reproduce recording information simply and certainly from the record medium with which bit rates differ. According to invention according to claim 35 to 37, it becomes possible to reproduce recording information simply and certainly from the record medium with which bit rates differ.
[0114] According to invention according to claim 38, it becomes possible to reproduce the read information continuously. According to invention according to claim 39, on the occasion of the handling of a regenerative apparatus, it becomes an effective record medium.
[0115] According to invention according to claim 40, it becomes possible to record the information on high quality on the original edition of a record medium efficiently, and it becomes possible to obtain the record medium by which the excess and deficiency of storage capacity were canceled with the original edition.
[0116] According to invention according to claim 41, it becomes possible to record the information on high quality on the original edition according to the storage capacity of a record medium. According to invention according to claim 42, on the occasion of implementation of the manufacture approach of a record medium, it is effective.
[0117] According to invention according to claim 43, on the occasion of implementation of the manufacture approach of a record medium, it is effective and a record medium can be used efficiently. According to invention according to claim 44 to 49, on the occasion of operation of the record approach, it becomes a suitable record medium.
[0118] According to invention according to claim 50, it becomes possible to record the information on high quality on the original edition of a record medium efficiently. According to invention according to claim 51, it becomes possible to record the information on high quality on the original edition of a record medium according to the storage capacity.
[0119] According to invention according to claim 52, on the occasion of implementation of the manufacture approach of the original edition of a record medium, it becomes effective. According to invention according to claim 53 to 58, on the occasion of operation of the record approach, it becomes the original edition of a suitable record medium.
[0120]
[Example]
(The 1st example) The 1st example which materialized this invention to the magneto-optic-disk recording device by the MPEG (Moving Picture Expert Group) method is hereafter explained according to drawing 1 - drawing 3 .
[0121] As shown in drawing 1 , the magneto-optic-disk recording device is equipped with A/D converter 68, the MPEG encoder 70, the chart-lasting-time directions circuit 74, and the compressibility arithmetic circuit 76. A/D converter 68 changes a video signal into digital data, and outputs the signal to the MPEG encoder 70.
[0122] The MPEG encoder 70 carries out compression coding of the digital data, and outputs an MPEG signal with a predetermined transfer bit rate. The chart-lasting-time directions circuit 74 generates record time data based on the chart lasting time of the image program specified by the user, and outputs the record time data to the compressibility arithmetic circuit 76.
[0123] The value of the storage capacity of the record section of a magneto-optic disk 66 is beforehand set to the compressibility arithmetic circuit 76. And based on the record time data inputted as the value of the storage capacity, the compressibility arithmetic circuit 76 determines a bit rate, and outputs the data of the determined bit rate to the MPEG encoder 70. A bit rate is determined based on the following formulas.
[0124] (Bit rate) = (total storage capacity of a record section) The internal configuration of the MPEG encoder 70 is shown in / (chart lasting time) drawing 3 . The image rearrangement processing circuit 10 rearranges a frame, gives priority to P picture and I picture after B picture over this B picture, and outputs it. The scan conversion macro blocking

circuit 12 divides each picture screen per block. A subtractor 14 creates a difference fractionation side with the present screen from the macro blocking circuit 12, and the prediction screen from the decode image memory 32. In addition, naturally, at the time of I picture, since the output of the prediction screen from the decode image memory 32 stops, the output from the macro blocking circuit 12 is bypassed. The DCT circuit 16 is a block unit (8x8 pixels). DCT processing is performed.

[0125] The quantization circuit 18 is quantized by doing the division of the output from the DCT circuit 16 with the multiplication value of the quantization matrix D1 mentioned above and the quantization step D2 outputted from the rate control section 24.

[0126] The variable-length encoder 20 is variable length coding (Huffman coding) about the output from the quantization circuit 18, macro block type information, and motion vector information. It carries out. Buffer memory 22 once stores the output data from the variable-length encoder 20. And this data is read with a predetermined bit rate, and it becomes an MPEG signal (coding bit stream).

[0127] The rate control section 24 is the granularity (quantization step) of quantization in the quantization circuit 18. It determines. That is, the rate control section 24 changes the target number of bits assigned to each screen based on the data of the bit rate outputted from the compressibility arithmetic circuit 76. And this rate control section 24 observes the number of bits encoded in the variable-length encoder 20, and determines that a quantization step will suit that target number of bits. If this quantization step is set up greatly, although image quality deteriorates, naturally the amount of data of this image will decrease. Therefore, by changing a bit rate, the target number of bits in the rate control section 24 is changed, and the compressibility of an image changes.

[0128] Moreover, as a circuit for the decode processing in an encoder, the MPEG encoder 70 is equipped with the motion detector 38 and the mode judging circuit while it is equipped with the reverse quantization circuit 26, the reverse DCT circuit 28, an adder 30, the decode image memory 32, and the motion compensation circuit 34.

[0129] The reverse quantization circuit 26 carries out processing contrary to the quantization circuit 18. The reverse DCT circuit 28 carries out processing contrary to the DCT circuit 16. The decode image memory 32 is memory which stores the original screen for creating a prediction screen. That is, the decode image memory 32 memorizes at least 2 screens. These two screens are I picture, I picture and I picture, P picture, or P picture and P picture. The decode image memory 32 outputs image data from terminal 32a for motion vector detection. The decode image memory 32 outputs the prediction screen of a macro block unit from terminal 32b.

[0130] The motion compensation circuit 34 makes a prediction screen output using motion vector information and macro block type information based on [image memory / 32 / decode] the screen stored in the decode image memory 32. The motion compensation circuit 34 makes a prediction screen output from terminal 32b by shifting and reading the coordinate of the screen in the decode image memory 32 using motion vector information. In addition, although two screens are stored all over the decode image memory 32, selection (one side, both, another side, and non-deer) of the data read from these two image data is set up using macro block type information.

[0131] The motion detector 38 compares the present screen with two decoded screens, and detects a motion vector. two difference of the screen into which the mode judging circuit 36 was inputted, and two decoded screens -- from information, functionality is detected and the above-mentioned macro block type information is outputted.

[0132] Next, an operation of this example constituted as mentioned above is explained. If a user inputs into the chart-lasting-time directions circuit 74 the chart lasting time of the video signal recorded on a magneto-optic disk 66, the compressibility arithmetic circuit 76 will determine the bit rate of the MPEG signal in an encoder 70 based on the storage capacity of a magneto-optic disk 66, and this inputted chart lasting time. That is, a bit rate will become high if the chart lasting time which the bit rate became low and was set up when the set-up chart lasting time excelled is short.

[0133] The data of the determined bit rate are inputted into the rate control section 24, and the target number of bits assigned to each screen is changed. And in this rate control section 24, the number of bits encoded in the variable-length encoder 20 is observed, and a quantization step is determined that it will suit that target number of bits. Then, with the multiplication value of the value of a quantization matrix table, and the value of the quantization step outputted from the rate control section 24, the division of the output from the DCT circuit 16 is done, and it is quantized in the quantization circuit 18. And variable length coding of the quantization data is carried out in the variable-length encoder 20, coded data is read from buffer memory 22 with the bit rate determined in the compressibility arithmetic circuit 76, and a video signal is recorded on the total storage capacity of the record section of a magneto-optic disk 66.

[0134] As described above, high-definition data are recordable in this example as much as possible using most record sections by having set up the bit rate according to the storage capacity in a record medium. Moreover, since it is made to do at the time of the storage capacity in a magneto-optic disk 66, and record and the compressibility in coding processing is set up indirectly, the optimal combination of chart lasting time and quality is acquired.

[0135] However, constraint joins a bit rate at the time of actual commercialization. First, there is a limit of the transfer rate in the read-out equipment part of the regenerative apparatus of a magneto-optic disk 66. For example, in the case of CD-ROM, it is 700K-byte/in the present condition. Second extent is the maximum high speed. For this reason, read-out more than this bit rate becomes impossible, and a bit rate is restrained by the read-out speed limit of this CD-ROM.
[0136] Moreover, the decoder of an MPEG signal also has a limit of a bit rate. For this reason, it is desirable to record by raising a bit rate as much as possible with the bit rate below these limits.
[0137] The bit rate in the 1st example and relation with chart lasting time are shown in drawing 2 . The rate value Ra is a value of the bit rate of the quality of the limiting value of a bit rate, and the lower limit which is decoding rate limiting value youthfully and can bear the rate value Rb on use. In addition, the rate value Rc is the any value between the rate values Ra and Rb, and time amount Tc is time amount Ta and Tb. It is the any value of a between. For example, by CD-ROM format, they are rate value Ra=5.6Mbps - rate value Rb=2.8Mbps or rate value Ra=8Mbps - rate value Rb=3Mbps. It is set up.
[0138] As shown in drawing 2 , a bit rate changes in the curve of 1/X after a certain time amount Ta. That is, in the dynamic image required to reproduce on real time, and the digital disk which records voice data, it is related with the image information on the die length to a certain time amount Ta (software), and is a certain fixed bit rate (usually read-out, the marginal rate of a transfer, or the marginal bit rate of a decoder). It records.
[0139] And when this time amount Ta is exceeded, it determines that a bit rate becomes bit rate = full storage capacity / chart lasting time, and data are recorded.
[0140] And since a bit rate turns into a rate of the minimum quality when chart lasting time becomes still longer and exceeds a certain time amount Tb, in beyond this time amount Tb, a bit rate is not lowered. It becomes impossible consequently, to record no image information on this one magneto-optic disk.
[0141] Therefore, in such a case, an information means to report a thing unrecordable on a user may be established. This information means may be constituted from some display means (CRT, LCD, warning lamp, etc.), and may consist of voice generating means (loudspeaker which emits a warning buzzer and a warning message). In addition, although drawing 2 showed the example to which the value of a bit rate was changed smoothly, in the above-mentioned CD-ROM format, you may change in the shape of a step per 500Kbps, for example.
[0142] Moreover, although considered as the recording apparatus which used the magneto-optic disk 66 in this example, you may apply to the recording apparatus used at the time of manufacture of the read-only optical disk with which information was recorded by the pit.
[0143] In this case, based on the chart lasting time of an image information program, and the storage capacity set up by the specification of an optical disk, compressibility is set up similarly. And the original recording (master disc) as the original edition of the record medium which wrote in the compressed information is created, and the optical disk which presses an optical disk and consists of pit information by this original recording is created.
[0144] Thus, the manufactured optical disk is an optical disk which changed the compressibility of said information and was recorded, when excess and deficiency will arise in storage capacity, if information is written in with basic compressibility.
[0145] That is, this optical disk is an optical disk which changed compressibility and decreased in number said excess and deficiency by changing said bit rate within the limits of rate value Ra-Rb, when excess and deficiency will arise in storage capacity, if information is written in with the compressibility of the arbitration corresponding to bit rate Ra-Rb within the above-mentioned specification.
[0146] For example, if information is written in with the minimum compressibility corresponding to the maximum bit rate value Ra of the above-mentioned specification, when lack will arise in storage capacity, by lowering said bit rate, this optical disk makes informational compressibility high, records it, and cancels said lack.
[0147] Moreover, for example, if information is written in with the maximum pressure shrinking percentage corresponding to the minimum bit rate value Rb of the above-mentioned specification, when an excess will arise in storage capacity, by raising said bit rate, this optical disk makes compressibility of said information low, records it, and turns into an optical disk which decreased in number said excess.
[0148] (The 2nd example) Next, the 2nd example of this invention is explained according to drawing 4 . In addition, the same sign was given to the same configuration member as the 1st example.
[0149] Although the MPEG signal was directly recorded in the 1st example, the disk recording apparatus 72 as a reconstruction means is formed, for example, he divides an MPEG signal into the data area of CD-ROM, and is trying to record on a disk in this example.
[0150] The disk recording apparatus 72 divides an MPEG signal, stores it in the data area of a CD-ROM format, and is reconfigurated and outputted to the data signal of a CD-ROM format.

[0151] The compressibility arithmetic circuit 76 computes the bit rate in a CD-ROM format, sends out the data of this rate to the disk recording apparatus 72, and determines the record bit rate of this disk 66. The data of the bit rate computed in the compressibility arithmetic circuit 76 are outputted also to an encoder 70. And an encoder 70 outputs an MPEG signal based on the bit rate for MPEG encoding according to the value of the record bit rate for this CD-ROM.
[0152] In addition, the bit rate in this case turns into a bit rate of CD-ROM. That is, they are 5.6Mbps - 2.8Mbps or 8Mbps - 3Mbps like the 1st example. It becomes. Therefore, the bit rate determined with the MPEG encoder 70 becomes lower than this.
[0153] The disk recording apparatus 72 divides an MPEG signal, and it was made to output the data signal of a CD-ROM format in the 2nd example based on the data of the bit rate computed in the compressibility arithmetic circuit 76, as described above. Therefore, an MPEG signal is recordable to the disk which has a format like CD-ROM.
[0154] (The 3rd example) Next, the 3rd example of this invention is explained according to drawing 5 . In addition, the same sign was given to the same configuration member as the 2nd example.
[0155] In this example, it has further AV multiplexing circuit 73 as a multiplexing means to multiplex A/D converter 69 for voice which changes a sound signal into digital data, the encoder 71 for voice which carries out compression coding of the digitized voice signal, and a sound signal and a video signal.
[0156] Based on the value of the storage capacity of a disk 66, and the chart lasting time of the record time setting circuit 74, the compressibility arithmetic circuit 76 computes each bit rate in the encoder 70 for images, AV multiplexing circuit 73, and the disk recording apparatus 72, and sets this up.
[0157] The data of high definition and the quality of loud sound are recordable in this example as much as possible in AV multiplexing circuit 73 using the great portion of storage capacity of a disk 66 using the signal which multiplexed the sound signal and the video signal by which compressibility was controlled.
[0158] Moreover, the bit rate in AV multiplexing circuit 73 and the disk recording apparatus 72 is also manageable by having made it output the data of the bit rate computed in the compressibility arithmetic circuit 76 to an encoder 70, AV multiplexing circuit 73, and the disk recording apparatus 72.
[0159] In addition, although the bit rate (compressibility) in the encoder 71 for voice was considered as immobilization in this example, a bit rate is changed and you may make it also change the compressibility of a sound signal.
[0160] Moreover, you may make it record the multimedia program which also includes text information and still picture information in addition to the image and speech information of an animation. Moreover, at the time of record of the multimedia program, compressibility is considered as immobilization and it may be made to carry out adjustable [only of the compressibility of animation information] except the image information on an animation according to chart lasting time. Furthermore, you may make it replace with the information which considers compressibility as immobilization according to the contents of a program of a multimedia program. That is, if it considers [whether compressibility is changed about each information which constitutes the multimedia program and] as immobilization or compressibility is changed, the value is set as how much, or you may make it give priority about ** according to the contents of a program of a multimedia program.
[0161] (The 4th example) Next, the 4th example of this invention is explained according to drawing 6 . After storing all condensed information, he is trying to once record in this example, although a bit rate is changed and it was made to record as it is in the 1st, 2nd, and 3rd example. That is, this example is applied to the creation time of the original recording for optical disk creation.
[0162] This example is equipped with the selection circuitry SEL as A/D converter 68, the MPEG encoders 70a, 70b, and 70c, Memory Ma, Mb, and Mc, and a selection means, and condensed-information selection-circuitry 76A.
[0163] A/D converter 68 changes a video signal into digital data. The MPEG encoders 70a, 70b, and 70c are set as different compressibility (bit rate), respectively. Memory Ma, Mb, and Mc once memorizes all the condensed information from the MPEG encoders 70a, 70b, and 70c. This memory Ma, Mb, and Mc consists of mass hard disks.
[0164] Condensed-information selection-circuitry 76A controls a selection circuitry SEL based on the storage capacity of original recording 66A for optical disk creation, and Memory Ma and Mb and the amount of information stored in Mc. The condensed information of the memory Ma, Mb, and Mc chosen by this selection circuitry SEL is recorded on disk 66A.
[0165] That is, it is below the maximum storage capacity defined by the specification of original recording 66A which it is going to create at this time, and the condensed information of the memory Ma, Mb, and Mc with most amount of information is chosen.
[0166] Next, how to manufacture an optical disk with the equipment of this example is explained. Two or more condensed information which first compressed information with different compressibility is created with two or more MPEG encoders 70a, 70b, and 70c. The created condensed information is stored in Memory Ma, Mb, and Mc, and the

condensed information recorded from said two or more condensed information is chosen based on the amount of information of the condensed information in the memory Ma and Mb and Mc, and the storage capacity set up by the specification of original recording A by the selection circuitry SEL. Subsequently, the selected condensed information is recorded on original recording 66A, and the optical disk which performs press forming using the original recording 66A, and has pit information is obtained.

[0167] As described above, in this example, it is below the maximum storage capacity defined by the specification of original recording 66A, and condensed information with most amount of information was chosen from the memory Ma, Mb, and Mc the information compressed with different compressibility was remembered to be by the selection circuitry SEL. Therefore, high-definition data are recordable using the great portion of maximum storage capacity of original recording 66A.

[0168] (The 5th example) Next, the 5th example of this invention is explained according to drawing 7 . Although compressibility was changed by changing a bit rate in the 1st, 2nd, and 3rd example, a format of the sampling frequency of audio signals, such as music data, a quantifying bit number, etc. is changed in this example.

[0169] This example is equipped with A/D converter 80, the disk recording device 82, the chart-lasting-time directions circuit 84, and the compressibility arithmetic circuit 86. A/D converter 80 changes an analog (audio) signal into digital data. The chart-lasting-time directions circuit 84 generates record time data based on the chart lasting time of the image program specified by the user, and outputs the record time data to the compressibility arithmetic circuit 86.

[0170] The value of all the storage capacity of the record section of the recordable disk 78 is beforehand set to the compressibility arithmetic circuit 86. This compressibility arithmetic circuit 86 determines values, such as a sampling frequency of DA converter 80, and a quantifying bit number (a sampling frequency or quantifying bit number), by the value of this storage capacity, and the chart lasting time of the chart-lasting-time directions circuit 84.

[0171] That is, if a sampling frequency and a quantifying bit number are increased, the amount of generating bits increases and what has the high bit rate of data is needed. For this reason, the data of high quality are recordable on an effective target using a record section by performing data logging of until disk capacity full with this high bit rate.

[0172] Moreover, according to the storage capacity and chart lasting time in a disk 78, the amount of generating bits at the time of digital conversion can be changed, and the optimal combination of chart lasting time and quality can be acquired.

[0173] (The 6th example) Next, the 6th example which materialized this invention to the magneto-optic-disk regenerative apparatus of an MPEG method is explained according to drawing 8 and drawing 9 .

[0174] The disk recorded by the above 1st - the 5th example changes in the recorded bit rate with disks. Therefore, a regenerative apparatus must read this, even if equipped with the disk with which bit rates differ. When playing conventionally the disk with which bit rates differ, the rotational frequency of a disk was made to change according to a bit rate. However, after changing the rotational frequency of a disk for that purpose, it will have to control correctly, and the configuration of a regenerative apparatus will become complicated.

[0175] Then, he is trying to reproduce information in this example, without changing the rotational frequency of a disk. This example is equipped with a rotary motor 90, the CD decoder 92, the CD-ROM decoder 94, the buffer memory 96 as a storage means, and the data decoder 98 for MPEG as shown in drawing 8 . Moreover, this example is equipped with the synchronizing signal detector 100, the roll control circuit 102, the clock generation circuit 104, pickup 106, the amount-of-data detector 108 as a detection means, and the pickup location read-out control circuit 110 as a control means.

[0176] The CD decoder 92 performs playback based on CD format. The CD-ROM decoder 94 performs playback based on a CD-ROM format. Buffer memory 96 memorizes temporarily the playback data outputted from the CD decoder 92 or the CD-ROM decoder 94. A data decoder 98 restores an MPEG signal. The CD-ROM format is recorded on the disk 88.

[0177] The internal configuration of a data decoder 98 is shown in drawing 9 . This data decoder 98 performs actuation contrary to the MPEG encoder 70. The MPEG signal outputted from buffer memory 96 is outputted to the variable-length decoder circuit 44, and is decrypted. In the data separation circuit 46, the data of the image which extracted motion vector information and macro block type information are outputted to the next reverse quantization circuit 48. Moreover, the data separation circuit 46 outputs motion vector information. In the reverse quantization circuit 48, reverse quantization is performed, and further, reverse DCT is performed in the reverse DCT circuit 50, data are restored, and it is outputted to an adder 52.

[0178] When the output of the reverse DCT circuit 50 is data of I picture, an adder 52 is made to bypass and is outputted to an image memory 54. Moreover, an adder 52 reads the data of the prediction screen from the motion compensation circuits 62 and 64 from image memories 58 and 60 at the time of the output of the screen of P picture and B picture, and

adds them to it.
[0179] An image memory 54 only adjusts output timing, and outputs the data processed per macro block to the image change-over circuit 56 by line sequential. The image change-over circuit 56 outputs a screen in order of normal.
[0180] In MPEG, the sequence of the screen sent differs from actual sequence. And I picture is required to reproduce P picture, or in order to reproduce B picture, I picture, P picture and I picture, I picture, or P picture and P picture is required. Image memories 58 and 60 are the memory for it, and they store I picture and P picture until actual sequence comes.
[0181] I picture or the P picture itself in this image memory 58 and 60 is outputted to the change-over circuit 56 from output terminals 58a and 60a by line sequential. The motion compensation circuits 62 and 64 shift and read I picture and P picture of image memories 68 and 60 corresponding to the motion vector information from the data separation circuit 46, specify the address, and output it per [output terminals / 58b and 60b] macro block.
[0182] As for the circuit of an image memory 58, output terminal 58b, and the motion compensation circuit 62, and the circuit of an image memory 60, output terminal 58b, and the motion compensation circuit 64, one side is outputting the prediction screen of the frame from after during the output of the prediction screen of the frame from before, as for another side.
[0183] In an adder 52, the prediction screen added between two prediction screens from this image memory 58, the motion compensation circuit 62, and an image memory 60 and the motion compensation circuit 64 is chosen according to macro block type information at the time of the output of the screen of P picture from a reverse DCT circuit, and B picture. in addition, alternative -- on the other hand -- both another side -- or it is not used. In addition, when using both, naturally the average of the prediction screen from both is added by the circuit means which is not illustrated.
[0184] As shown in drawing 8 , the synchronizing signal detector 100 detects a synchronizing signal based on the regenerative signal of the CD decoder 92, and outputs it to the roll control circuit 102. The roll control circuit 102 controls a motor 90 based on the synchronizing signal. The clock generation circuit 104 outputs the clock signal for operating said CD decoder 92, the CD-ROM decoder 94, and the roll control circuit 102 synchronously.
[0185] The high-speed reading means is constituted from this example by a motor 90, CD decoder, the CD-ROM decoder 94, the synchronizing signal detector 100, the roll control circuit 102, the clock generation circuit 104, and pickup 106.
[0186] Even if a high-speed reading means is the disk of what kind of bit rate, it rotates a disk with the highest rotational speed, and reads data. The highest rotational speed is a rate which can read a disk with a bigger reading bit rate than the greatest bit rate of the bit rates of two or more disks.
[0187] The amount-of-data detector 108 outputs the detecting signal to the pickup location read-out control circuit 110 while detecting the amount of data accumulation of buffer memory 96. The pickup location read-out control circuit 110 controls pickup 106 based on the detecting signal of the amount-of-data detector 108.
[0188] In this example, the information on the disk read by the high-speed reading means is stored in buffer memory 96 through CD decoder and the CD-ROM decoder 94. And if buffer memory 96 becomes close to the specified quantity, based on the detecting signal of the amount-of-data detector 108, the writing to the buffer memory 96 will halt. Then, if allowances arise in buffer memory 96, the writing of a from will be resumed while having stopped the point temporarily. At the time of the restart of writing, based on the detecting signal of the amount-of-data detector 108, the location read-out control circuit 110 controls pickup 106, and pickup 106 is returned to the halted disk location.
[0189] And according to the memory capacity of buffer memory 96, pickup 106 is controlled and a pause track jump and playback are repeated. As mentioned above, by this example, even if it reads data with the rotational speed of the highest disk, buffer memory 96 does not overflow. Moreover, since data are read from buffer memory 96 with constant speed even if it is a time of writing being stopped, data are not disrupted and it can reproduce continuously. Consequently, the disk with which bit rates differ can be played easily, without changing the engine speed of a disk. In addition, as a technique which is related to this example, it is JP,4-188472,A (G11B20/18). There are some which were indicated. This invention rereads the digital signal which was made to rotate a disk rather than a standard trace rate at high speed, and was accidentally read in the information recorded on CD, without being late for actual reproduction speed.
[0190] It is made for this example to rotate a disk on the other hand with the highest rotational speed which can read data with a bigger reading bit rate than the greatest bit rate of the bit rates of two or more disks.
[0191] However, it is indicated that reading data to indicated invention with a bigger reading bit rate than the greatest bit rate is not indicated, but it rotates a disk only at high speed. Therefore, the read-out bit rate of CD is not fixed, and cannot necessarily read data with the reading bit rate of this example described above not necessarily. Therefore, operation effectiveness like this example cannot be acquired in indicated invention.

[0192] (The 7th example) Next, the 7th example is explained according to drawing 10 R> 0 and drawing 11 . In this example, the Variable Bit Rate encoder 122 which a bit rate is changed for every time amount, and carries out compression coding of the data instead of the encoder of the 1st which carries out compression coding of the data with the bit rate of immobilization - the 4th example is adopted. This encoder 122 was adopted for using the concept of an average bit rate instead of the bit rate of immobilization.
[0193] bit rate (storage capacity / duration) of the final average at the time of encoding this through the whole image software it is . That is, an average bit rate is determined that the total amount of data which multiplied this average bit rate and the duration of software is settled in a record medium. Moreover, an average bit rate is determined are recorded in a record medium more than a certain amount of rate part.
[0194] Here, the most effective decision approach of this average bit rate is explained. As the 1st approach, the time average of the amount of bits generated at the time of encoding termination of all software is determined. That is, it considers as the duration = average bit rate of the whole storage capacity / software of the whole software. However, a very detailed encoding plan is needed for this. But, this approach is approach most effective when attaining the purpose of acquiring uniform image quality inside image software.
[0195] As the 2nd approach, the predetermined time amount range is planned and the average bit rate in the plan time amount within the limits is adjusted. For example, 1 which makes the average bit rate within for 10 minutes 3Mbit / second It determines to make the average bit rate within time amount into 5Mbit / second etc., and the necessary number of bits in the meantime is set up as desired value. For example, if the average bit rates for 10 minutes are 3Mbit / second, the amount of necessary bits in the meantime is 3Mbit x600. They are 1.8Gbit(s) at a second. Planned control of the amount of generating bits will be carried out by the encoder side so that it may become.
[0196] In addition, it will be said that the above-mentioned plan time amount range is effective for improvement in the subjective image quality which the direction determined within the largest possible limits from the reason it is desirable for image quality to be fixed mentioned above in one dynamic-image software.
[0197] Next, a magneto-optic-disk recording device is explained. In addition, the same sign was given to the same configuration as the 2nd example. As shown in drawing 10 , the magneto-optic-disk recording apparatus is equipped with the Variable Bit Rate encoder 122 and the average compressibility arithmetic circuit 124.
[0198] The average compressibility arithmetic circuit 124 calculates the average bit rate which performs encoding (compression coding) from the given chart lasting time and the storage capacity of disk media. The Variable Bit Rate encoder 122 encodes the digital data outputted from A/D converter 58 with a Variable Bit Rate according to directions of the average bit rate from the average compressibility arithmetic circuit 124. This encoder 122 encodes repeatedly until it becomes that given average bit rate. In addition, you may make it determine an encoding schedule based on brightness data and motion data into which the encoder 122 was inputted for every scene of an image.
[0199] Moreover, if a bit rate is made adjustable, the recording rate in the case of being recorded on a disk must also be made adjustable. For this reason, this bit rate information is inputted also into the disk record circuit 72, and disk record which met the bit rate of that image is performed.
[0200] Now, in the case of analog data, the image data inputted into this equipment is first changed into digital data with A/D converter 58, and that output is encoded with an encoder 122. An average bit rate is determined by the average compressibility arithmetic circuit 124 at the time of this encoding. The average compressibility arithmetic circuit 124 will determine that compressibility using the inputted chart lasting time, and directions of this compressibility are inputted into the Variable Bit Rate encoder 122. In the encoder 122 interior, encoding is performed so that it may become the value to which the bit rate of the average in that image software was given according to directions of this average bit rate.
[0201] Thus, the example of bit rate change of the data with which encoding was performed is shown in drawing 11 . The axis of ordinate of drawing 11 shows a bit rate, and an axis of abscissa shows time amount change. For 1.95Mbps (es) and the highest bit rate, with this graph, 7.4Mbps(es) and an average bit rate are [the minimum bit rate] 4.5Mbps (es). It has carried out. The section X near the minimum bit rate is the very low scene of brightness, such as night, or a scene like a still picture from which the situation of a screen hardly changes. The section Y near the highest bit rate is a for example very bright scene or the intense scene of a motion. Although drawing 11 shows the example at the time of carrying out adjustable [of the bit rate] with part unit extent, it is still finer, for example, a bit rate may be made adjustable per several seconds.
[0202] As described above, in the 7th example, by having given directions of an average bit rate to the Variable Bit Rate encoder 122, it can encode so that an encoder 122 may serve as a value of the average bit rate, consequently a uniform image can be obtained inside image software.
[0203] In addition, shape may be taken as follows and this invention can acquire the same effectiveness as each above-

mentioned example also in such a case.
(1) Although compressibility was changed by changing the bit rate of the MPEG encoder 70 in each above-mentioned example, you may make it change compressibility directly.
[0204] (2) Although the 1st example of the above explained the case where data were recorded on all one sheets of a magneto-optic disk 66, it is not independently limited to this. That is, the magneto-optic disk 66 recorded to the middle is sufficient. In addition, what is necessary is just to add a means to detect the remaining storage capacity (non-record section) to the compressibility arithmetic circuit 76 in this case.
[0205] The bit rate at this time is as follows.
(Bit rate) = (storage capacity of sheep record section) / (chart lasting time) -- if it does in this way, the remaining storage capacity can be used for an effective target.
[0206] (3) Although the 1st example of the above explained the case where one program was recorded on all one sheets of a magneto-optic disk 66, it is not independently limited to this. That is, two or more programs may be recorded. When recording two or more programs, the value of the bit rate of one program may be beforehand set up with Rb between two programs, and the bit rate of the program of another side may be determined.
[0207] The bit rate of the program of another side at this time is as follows.
(Bit rate of the program of another side) =[all storage capacity - (chart-lasting-time xRb of one program)] / (chart lasting time of the program of another side) -- if it does in this way, the information on two or more programs is recordable on an effective target using the disk 66 of one sheet.
[0208] (4) You may make it control the rotational speed of a disk by the 6th example of the above according to the bit rate of the data currently recorded on the disk, although data were read with the highest rotational speed, without being limited to this. However, it is troublesome to rotate a disk correctly according to two or more rotational speed.
[0209] Then, it sets up so that it may read with a rotational speed [a little] earlier than an original read-out rate, and you may make it prepare some buffer memory like the 6th example. The early rotational speed is a rate in which read-out by the bigger read-out bit rate a little than the rate in which read-out by the usual read-out bit rate is possible is possible. And the amount of stored data of this buffer memory is observed, and you may make it pickup of read-out etc. repeat a pause track jump and playback. If it does in this way, it will become unnecessary to rotate a disk correctly according to two or more rotational speed.
[0210] (5) In the 6th example of the above, when the disk with which bit rates differ was played, it applied, but when the data with which bit rates differ are recorded on the disk of one sheet, you may apply. What is necessary is just to make the value of a read-out bit rate larger among two or more bit rates of the disk of one sheet than the value of the greatest bit rate, when playing this disk. Moreover, the value smaller [including the bigger value among two or more bit rates than the value of the greatest bit rate] than the big value in the value of a read-out bit rate may be set up gradually. For example, when a bit rate is the disk of 3Mbps(es), 5Mbps, and 8Mbps, a read-out bit rate can set up values, such as 4Mbps, 6Mbps, and 9Mbps.
[0211] (6) When adopting high-speed read-out in the 6th example of the above, it is JP,4-188472,A (G11B20/18). You may make it adopt the rereading appearance technique at the time of the indicated error. That is, the error of the signal restored by the CD decoder 92 and the CD-ROM decoder 94 is detected, and an error detection means to output the detecting signal to the pickup location read-out control circuit 110 is established. If the data stored in buffer memory are close to the specified quantity when it is judged that an error is in the digital signal read by the error detection means, writing will halt. At this time, pickup is returned to the location which halted trace of a disk. And it is written in so that the data with which the digital signal judged to have mistaken was reread, and the reread data was already stored in buffer memory may be followed correctly. If it does in this way, data are continuously reproducible like high-speed read-out at the time of rereading at the time of an error.
[0212] (7) Although chart-lasting-time data were generated in each above-mentioned example based on the chart lasting time of the image program specified by the user in the chart-lasting-time directions circuit 74, you may make it generate chart-lasting-time data based on the chart lasting time currently recorded into image software. If it does in this way, the time and effort as which a user specifies chart lasting time can be saved.
[0213] (8) Shape may be taken as a record regenerative apparatus which combined one of recording devices, and the regenerative apparatus of the 6th example among the 1st example - the 4th example. If it does in this way, one equipment can perform informational record playback.
[0214] (9) Although the optical disk was manufactured using the original recording for optical disk creation, you may make it manufacture each record medium in the 1st example of the above using the original edition of record media, such as other magneto-optic disks, a phase change mold disk, a hard disk, a magnetic tape, and semiconductor memory.
[0215] The record medium in this invention is defined as follows.

Record medium: It is the medium which records information and media, such as a magneto-optic disk, an optical disk, a phase change mold disk, a hard disk, a magnetic tape, and semiconductor memory, are included.
[0216] Invention of those other than the claim which can be grasped from the above-mentioned example is indicated with the following effectiveness. The manufacture approach of the record medium which creates the record medium which has pit information by press forming using the original edition of the record medium with which condensed information was written in claims 40 and 41 in the manufacture approach of the record medium a publication. If it does in this way, the optical disk which is a record medium can be created.
[0217]
[Effect of the Invention] According to this invention, the following effectiveness can be acquired.
1] The information on high quality is recordable, using a record medium efficiently.
[0218] 2] The recording information of high quality is easily reproducible from the record medium with which bit rates differ.
3] The information on uniform quality is recordable on a record medium.
[0219] 4] A suitable record medium can be obtained on the occasion of operation of the record approach.
5] The original edition of a suitable record medium can be obtained on the occasion of operation of the record approach.

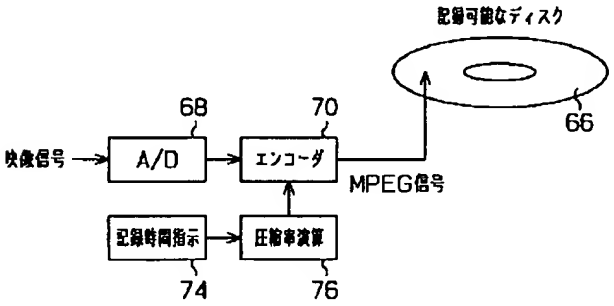
[Translation done.]

* NOTICES *

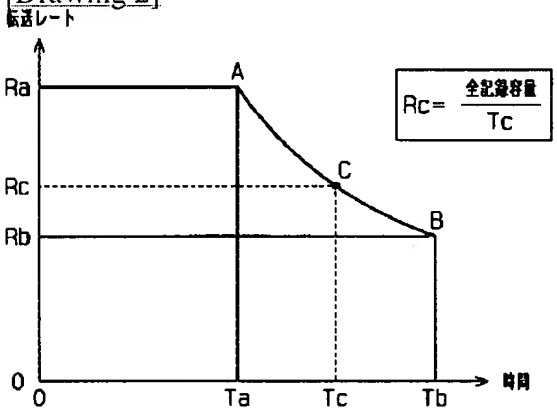
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]

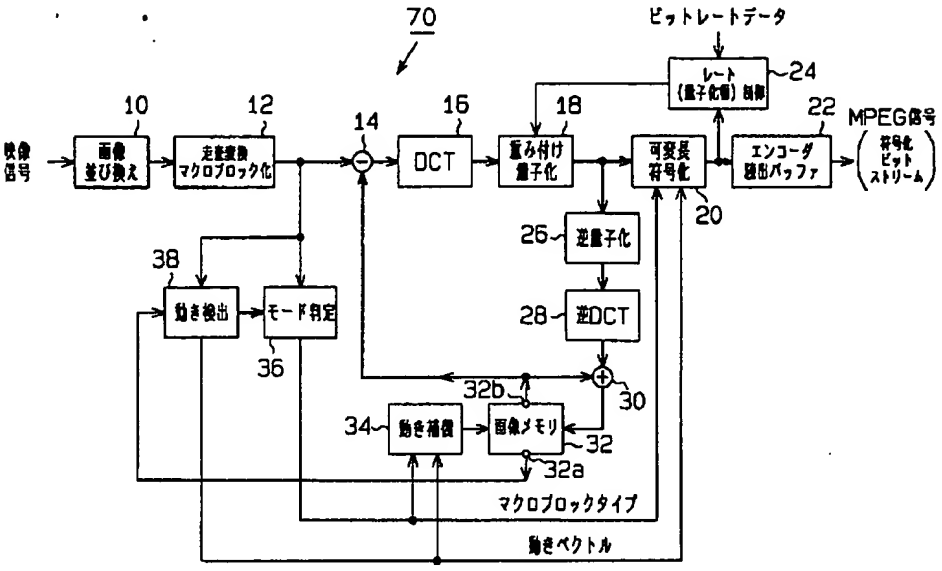


[Drawing 2]

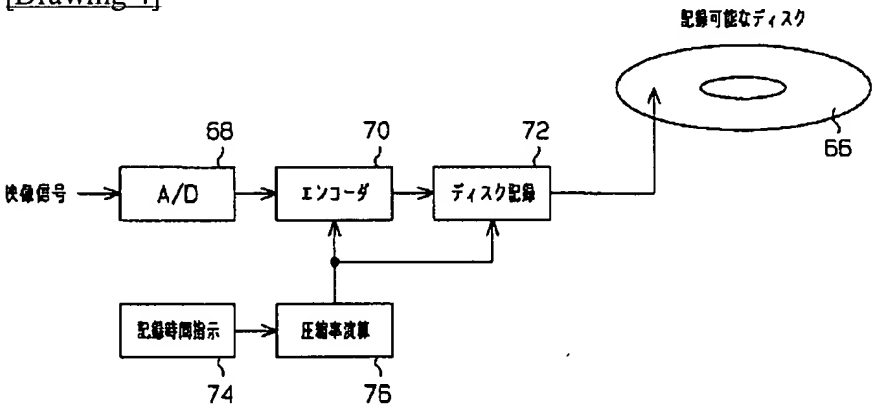


Ra: 転送レート制限もしくはデコードレート制限
Rb: 使用上耐え得る最低限界の品質の転送レート

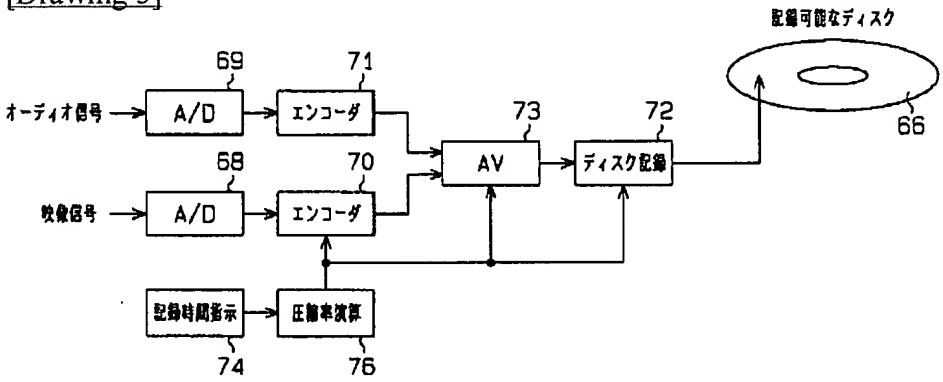
[Drawing 3]



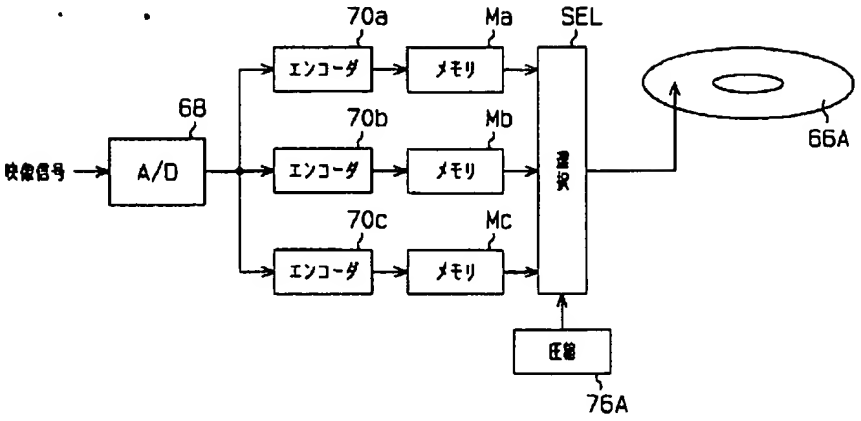
[Drawing 4]



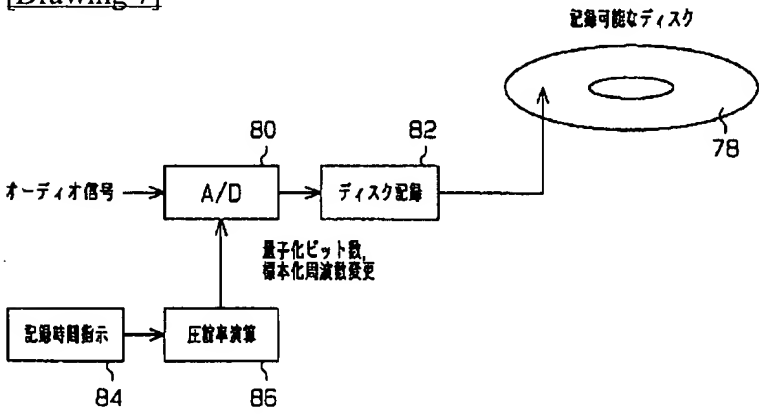
[Drawing 5]



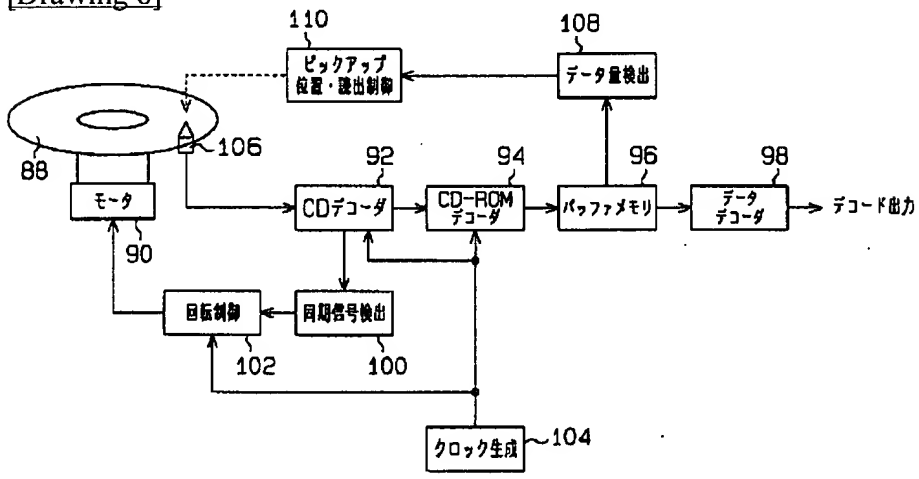
[Drawing 6]



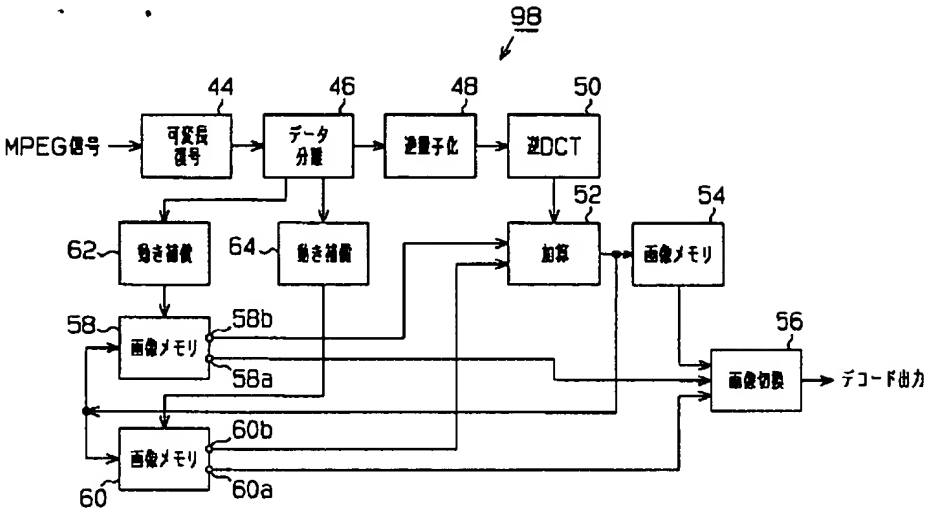
[Drawing 7]



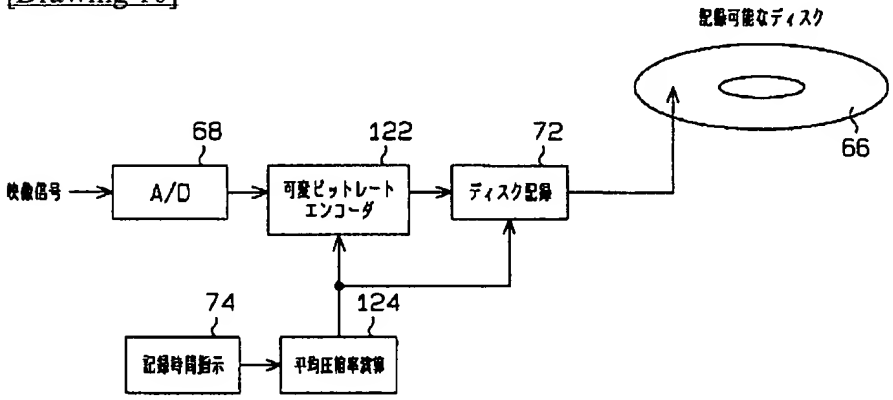
[Drawing 8]



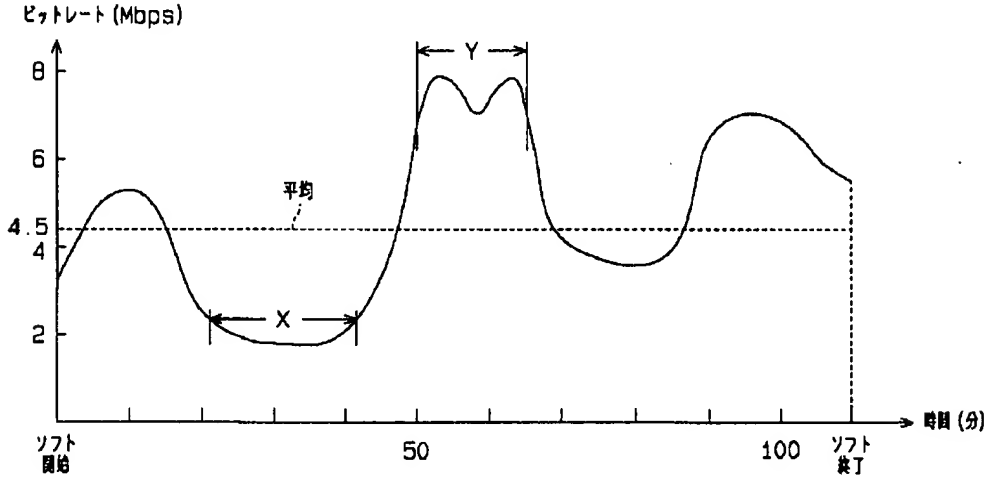
[Drawing 9]



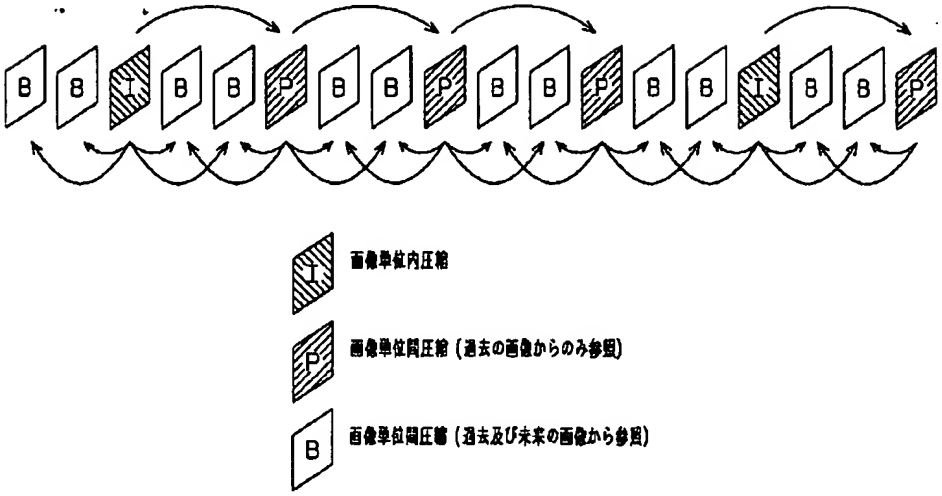
[Drawing 10]



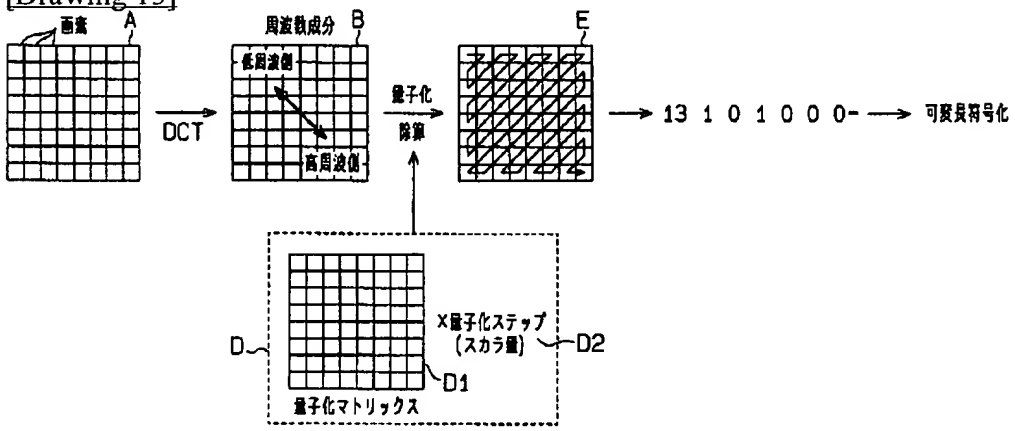
[Drawing 11]



[Drawing 12]



[Drawing 13]



[Translation done.]